

# Watershed Monitoring Program Comparison Kirsten Gallo - AREMP

PIBO  
EMAP  
AREMP





# Program Objectives

- ❖ *PIBO* – effects of management activity on aquatic and riparian communities in the range of PACFISH/INFISH and bull trout within the interior Columbia Basin
- ❖ *EMAP* – monitor and assess the status and trends of national ecological resources
- ❖ *AREMP* – effectiveness of Northwest Forest Plan on restoring and maintaining good watershed condition



# Study Design

- ❖ *PIBO* – random selection of 6<sup>th</sup> field HUCs stratified by ecoregion and management level
- ❖ *AREMP* – random selection of 250 6<sup>th</sup> field HUCs within NWFP area
- ❖ *EMAP* – random selection of sample sites



# Watershed Selection

- ❖ Generalized Random Tessellation Stratified design
- ❖ developed by EPA
- ❖ random selection of site locations
- ❖ sample is spatially balanced across resource



# Watershed Selection Constraints

	PIBO	EMAP	AREMP
Land Ownership	$\geq 50\%$ Federal	None	$\geq 25\%$ Federal
Gradient	$< 3\%$	None	None

# PIBO

- ❖ 6<sup>th</sup> field HUCs
- ❖ 1 sample site per watershed
- ❖ lowest-most nonconstrained reach



# AREMP

- ❖ 6<sup>th</sup> field HUCs
- ❖ multiple randomly-selected sites per watershed
- ❖ Sites selected using GRTS



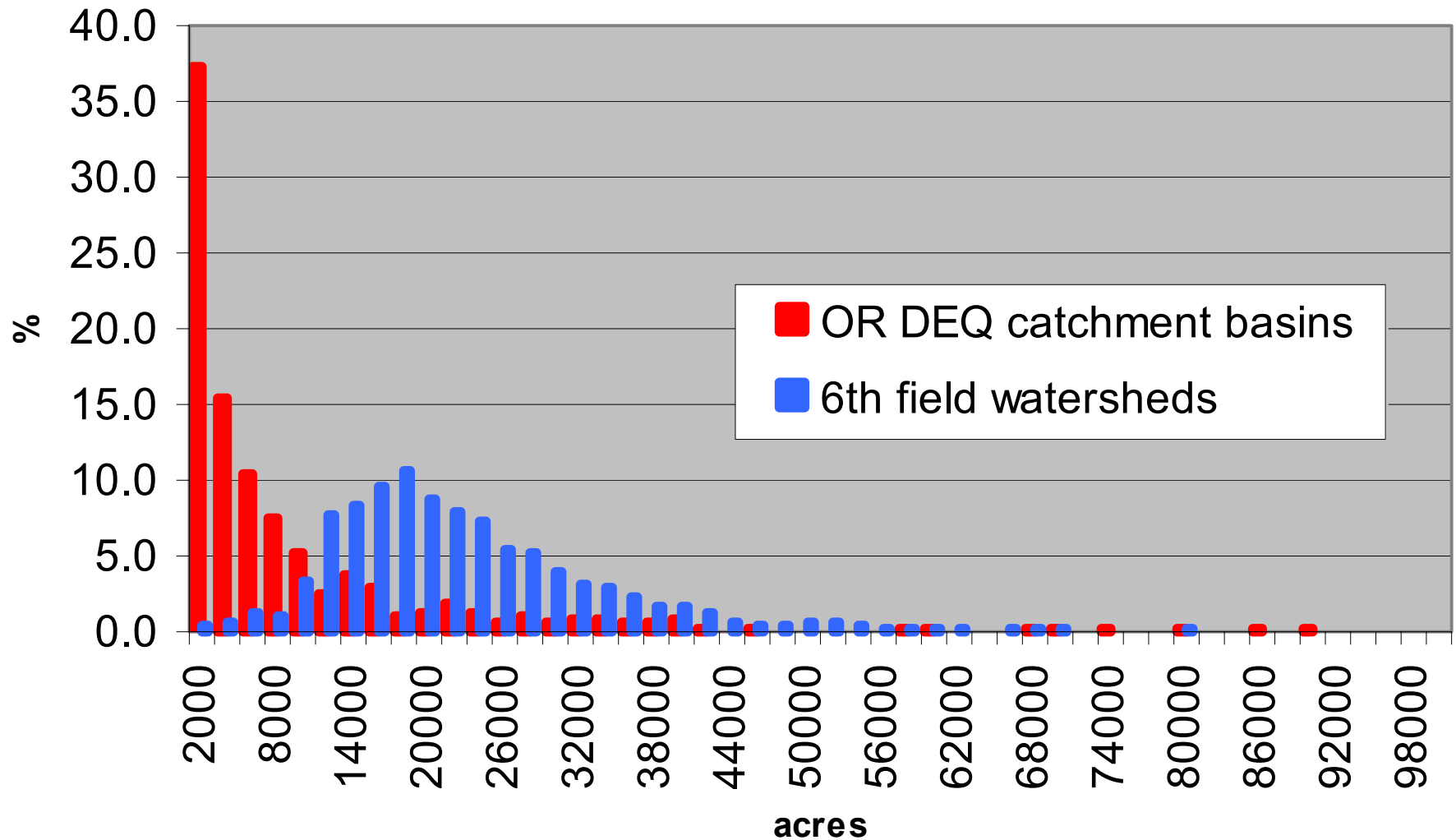
# EMAP

- ❖ Randomly-selected sites
- ❖ Watersheds delineated above site
- ❖ 1 site per watershed





# Comparison of watershed areas





# Site Layout

	PIBO	EMAP	AREMP
Reach length	20x BF	40x wetted	20x BF
Minimum length	80 m	150 m	150 m

# Common Indicators

	PIBO	EMAP	AREMP
BF Width, Depth	X	X	X
Entrenchment	X	X	X
Sinuosity	X	X	X
Slope	X	X	X

# Common Indicators

	PIBO	EMAP	AREMP
Substrate	X	X	X
Large Wood	X	X	X
Pools	X	X	X
Pool Depth	X	X	X

# Biological Indicators

	PIBO	EMAP	AREMP
Periphyton	X	X	X
Invertebrates	X	X	X
Amphibians			X
Fish		X	X

# Protocol Focus

- ❖ Slope
- ❖ Bankfull width
- ❖ Percent pools
- ❖ Substrate  $D_{50}$





# Slope

- ❖ *PIBO & EMAP* – water surface
- ❖ *AREMP* – stream bed surface





# Bankfull Width

- ❖ *PIBO* – measured at 4 cross sections, located in the widest point in the first 4 riffles
- ❖ *EMAP* – measured at 11 equally-spaced cross sections
- ❖ *AREMP* – measured at 6 or 11 equally-spaced cross sections





# Percent Pools

- ❖ *PIBO* – pools must be more than half wetted channel and include thalweg, and be longer than wide, maximum depth  $> 1.5\times$  tail crest depth
- ❖ *EMAP & AREMP* – pools must span wetted channel and be longer than wide



## Substrate $D_{50}$

- ❖ *PIBO* – measure 25 pebbles in each of the first 4 riffles
- ❖ *EMAP* – measure 5 pebbles at 21 equally-spaced transects
- ❖ *AREMP* – measure 11 pebbles at 11 equally-spaced transects



# Summary

- ❖ All programs are designed to assess effects of management on resources.
- ❖ In general, protocols are very similar between programs.
- ❖ Need to assess whether data collected by each program differs predictably.